Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules to	)	
Facilitate the Use of Cellular Telephones and	)	
Other Wireless Devices Aboard Airborne Aircraft	)	WT Docket 04-435

COMMENTS OF ROCKWELL COLLINS, INC.

Rockwell Collins, Inc. ("Rockwell Collins") pursuant to Section 1.415 of the Federal Communications Commission's ("Commission's" or "FCC's") rules, hereby files electronic comments in the above referenced proceeding,[1] which seeks to replace or relax the ban on airborne usage of 800 MHz cellular handsets under Part 22 of the Commission's rules.

INTRODUCTION

Rockwell Collins is a global company that manufactures safety-critical communications and navigation avionics equipment that may be sensitive to Radio Frequency ("RF") emissions from airborne use of cell phones and other wireless transmitter devices.

Rockwell Collins is an active participant in numerous RTCA committees recommending technical standards for avionics equipment and, in particular, RTCA SC-202. RTCA SC-202 is studying the impact of portable electronic devices ("PEDs") on aircraft operational safety including such aspects as navigation and communication. Therefore, Rockwell Collins is a party in interest to this proceeding.

DISCUSSION

Rockwell Collins commends the Commission for undertaking the complex task of bringing the FCC's regulation in-line with today's technological advances. We are pleased the

[1] *See* In the Matter of Amendment of the Commission's Rules to Facilitate the Use of Cellular Telephones and other Wireless Devices Aboard Airborne Aircraft, WT Docket No. 04-435, Notice of Proposed Rulemaking, 70 Fed. Reg. 11916 (March 10, 2005)(NPRM).

FCC is reexamining its regulation concerning the use of cellular phones aboard airborne aircraft. Our comments are limited to specific issues in the following sections of the NPRM:

A. Use of Wireless Handsets Controlled by Onboard Pico Cells

1. Technical Requirements for Pico Cells

The Commission has proposed to permit the use of cellular handsets on airborne aircraft so long as they are operated under the control of a pico cell that instructs the handsets to operate at a sufficiently low power setting in order to not interfere with the terrestrial systems.[2] Rockwell Collins supports the general intent of the FCC proposal. Rockwell Collins recommends, however, that the Commission provide a clear and concise definition for a "pico cell" and also provide specific guidance on the operation of the "pico cell."

A "pico cell" should be defined as:

> "any device (including hardware or software) that controls all cell phones as well as any wireless devices on an aircraft, provides a communications interface to a terrestrial system, and that prevents the cell phones and wireless devices from causing interference to terrestrial cellular systems."

The Commission should also mandate that pico cells on commercial air transportation category aircraft ("commercial aircraft") are required to control all cell phones and wireless devices in such a manner as to prevent interference to terrestrial systems (i.e. any wireless device that is turned on must be controlled by the pico cell to prevent interference to terrestrial systems.).[3] Further, the FCC should allow enough flexibility in its regulation to allow the system integrators to design, develop, and incorporate their own hardware or software. Additionally, the Commission should create procedures to regulate the transfer of the cell phones to/from the pico cell to terrestrial systems at low altitudes.

---

[2] NPRM, Paragraph 16.

[3] Rockwell Collins notes that the Federal Aviation Administration ("FAA") will provide guidance to prevent potential interference to the aircraft and aircraft systems if cell phones are permitted to operate on airborne aircraft.

Rockwell Collins recommends that the pico cell should be required to provide power control and other features which assure the wireless handsets roam reliably onto it at the start of airborne operation and remain under its control during normal operation. In addition, the pico cell should be able automatically to switch the phones to a safe/standby mode if pico cell control is lost or if aircraft phase-of-flight restrictions are in effect. The FCC should set the standards for power levels as well as interference levels for cell phones that are being operated under the control of pico cells. This would allow aircraft to use specialized antenna and power controls, which would enable a more useful 800 MHz radio link. Also, the power levels for cell phones on aircraft should be flexible; however, they should not exceed the upper bound limits for aircraft system hazardous considerations.

The Commission has requested comments on whether technical rules should be adopted regarding the onboard operation of pico cells using the 800 MHz cellular spectrum.[4] Rockwell Collins recommends that technical rules should be adopted by an industry group representing both cellular service and aviation interests, such as the Electronic Industries Alliance and/or its affiliate the Telecommunications Industry Association. These rules should address: the standards for pico cell handoffs to terrestrial networks based on phase-of-flight; the procedures for regulating the failure of pico cells that may cause the cell phones to search for terrestrial systems; and the requirements for the pico cell controlling multiple cell phone technologies.

The Commission also seeks comments on ways to ensure that the operation of mobile telephones and mobile data services on airborne aircraft will not create the potential for harmful interference to terrestrial cellular networks.[5] As previously mentioned, Rockwell Collins recommends that the Commission require all wireless devices on aircraft to be under control of a

[4] NPRM, Paragraph 16.
[5] NPRM, Paragraph 10.

pico cell when they are being operated. The Commission needs to provide guidance for the orderly handoff between the pico cell and the terrestrial network at takeoff and landing.

Possible approaches include RF spectrum monitoring, cabin enunciator, and pico cell control equipment in the cabin. In order to mitigate interference, the pico cell must have the ability to control all cell phones located on the aircraft. We believe it is possible to miniaturize and integrate a system that performs this task. The Commission may want to consider adopting a different set of rules for commercial aircraft and private aircraft because likelihood of continued accidental use on commercial aircraft would be higher. The FCC should also consider rules requiring pico cells on commercial aircraft to control **all** cellular frequency bands (i.e. 800, 900, 1800, and 1900 MHz) and modulations to eliminate attempts by rogue phones to connect directly to terrestrial systems. Commercial aircraft have the potential to produce greater levels of interference to terrestrial systems since they are likely to have more cell phones due to the larger number of passengers.

Private aircraft should present a simpler case since the phone systems will be generally known and controlled for the 800 MHz band and there will be fewer passengers on these aircraft. As a result, the FCC should set less stringent requirements for pico cells located on private aircraft.

The Commission also has requested comments on whether it should adjust its out-of-band and spurious emission limits on cellular handsets in order to ensure that aircraft systems are not affected by unwanted emission from cell phones.[6] Rockwell Collins recommends that these limits be adjusted. The existing U.S. mobile phone regulations have rather high Effective Radiated Power ("ERP") limits and loose out-of-band emission standards when compared to their actual performance. The pico cell and cell phones must have a lower ERP limit than is

[6] NPRM, Paragraph 16.

prescribed in Part 22 (500 watts for base stations and 7 watts for cell phones).[7] These limits are substantially inconsistent with the actual low power levels that are likely to be used on aircraft, and the operation of the cell phones and pico cells at these levels could potentially cause harm to the aircraft systems as will be described below.

Parts 22, 24, and 90 of the Regulations all contain an out-of-band emissions constraint which limits the emission value to -43 dBW independent of the transmit power.[8] It is Rockwell Collins' view that this limit is too high. The National Aeronautics and Space Administration ("NASA") has performed tests[9,10] that illustrate the out-of-band emissions are considerably below the FCC's current requirement (-43 dBW) in the aeronautical frequency bands. The out-of-band emissions for one test ranged between -100 and -75 dBW[11] while the out-of-band emissions for another test ranged between -135 and -105 dBW.[12] The results of these tests indicate that the cell phones may be operated without interfering with the onboard aircraft systems. However, the safety of the aircraft systems is not assured since the FCC's current regulatory standard of -43 dBW is much higher than the limits from NASA's tests. Also, a comparison between the FCC's current requirement and the permitted single device radio frequency interference ("RFI") emissions for compatibility with onboard ILS Localizer receiver reveals that that -43 dBW is about 106 dB too high.[13] The FCC's existing standard would permit low power mobile phone transmitters to emit more out-of-band power than in-band

---

[7] *See* 47 C.F.R. § 913(a).

[8] *See* 47 C.F.R. § 917(a), 47 C.F.R. § 24.238(a), and 47 C.F.R. § 90.691(a).

[9] Nguyen, Truong X., *et al*, "Third Generation Wireless Phone Threat Assessment for Aircraft Communication and Navigation Radios," NASA/TP-2005-213537, NASA Langley Research Center, Hampton, VA, March, 2005 (NASA Report #1).

[10] Ely, Jay J., *et al*, "Wireless Phone Threat Assessment and New Wireless Technology Concerns for Aircraft Navigation Radios," NASA/TP-2003-212446, NASA Langley Research Center, Hampton, VA, July, 2003 (NASA Report #2).

[11] NASA Report #1, Tables 3.4-39, -40. Out-of-band emission results for a large group of 800 MHz band CDMA and GSM phones ranged between -100 and -75 dBW for the transmitter 6th harmonics falling in the 5030 – 5090 MHz MLS receive band.

[12] NASA Report #1, Tables 3.4-31, -32. Out-of-band emission results in the Aeronautical VOR/Localizer/VHF Communication band (108 – 136 MHz) for the 800 MHz band CDMA and GSM group of mobile phones range from about -135 to -105 dBW

[13] SC-202, "Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft," RTCA Document No. RTCA/DO-294, Table 6.5, line 20.

power. In order to effectively control the RFI in low power (power control) operation from mobile phones and pico cell base stations, the Commission should adjust the regulatory out-of-band limits to a more stringent combined fixed/variable attenuation ratio to transmitter power. We are unable to prove a specific recommendation for the out-of-band emissions limit at this time since the technology related to the pico cell is still being developed. Specific recommendations can be made at a later date after the development of the pico cell is completed.

The FCC also seeks comments on whether it should mandate that pico cells cover a specific set of technologies so that all handsets on board aircraft are controlled by a pico cell.[14] As previously mentioned, Rockwell Collins recommends that different standards should exist for commercial aircraft and private aircraft.[15] On commercial aircraft, pico cells should be required to interact with a wide range of mobile phone air interface standards. By requiring pico cells to control the different types of cell phone technologies, the possibility of cell phones operating at different power levels that may cause interference to terrestrial systems would be eliminated. In addition, the air cabin staff would not have to monitor the use of different types of cell phones, which are indistinguishable in appearance by most passengers and air cabin staff. On private aircraft, it is not necessary that the pico cell base stations interact with a wide range of air interface standards because the private aircraft provides a more controlled environment regarding use of cell phones and wireless devices.

2. Licensing Provisions

The Commission also has requested comments on whether any parties besides, or in addition to, the cellular licensees should have rights to use the 800 MHz spectrum.[16] Rockwell Collins recommends that a different licensing scheme be employed for providers (i.e. manufacturers and suppliers) of the aircraft equipment. Airlines, Original Equipment

[14] NPRM, Paragraph 15.
[15] *Id* at Page 4.
[16] NPRM, Paragraph 18.

Manufacturers (OEMs), and suppliers will want to have access to the 800 MHz spectrum, since they will play a predominant role in the development, operation, and installation of the airborne cellular infrastructure. In addition, these parties will want to provide service to all cell phones on the aircraft, not just those belonging to a single carrier/licensee. This will require, at the least, multiple secondary market arrangements but it may be more appropriate for the FCC to grant the airlines, OEMs, and suppliers permission to use the 800 MHz spectrum. In addition, the Commission should mandate that all business arrangements for roaming between the different carriers ensure that service will be provided to all cell phones, regardless of carrier or signal type (GSM, CDMA, GPRS, EDGE, etc…).

The FCC also seeks comments on whether its rules should be amended to allow cellular licensees to provide service on a secondary basis to airborne units.[17] This will be the likely outcome since the Commission has already granted AirCell a license to provide this type of service.[18] Assuming this to be the case, Rockwell Collins is concerned that the cell phone and other wireless device users who do not subscribe to the service may be prevented from accessing the service unless they pay an additional fee to the licensees. As a result, we propose that the FCC prohibit the licensees from charging the unsubscribed users an additional fee for use of their service. The Commission must also address the coverage-area for licenses and roaming agreements. Currently, the licenses are awarded on a geographic basis.[19] The roaming agreements would have to be created to allow delivery of service to multiple carriers through a single carriers' system, regardless of the type of phone or carrier (i.e. GSM, CSMA, EDGE, GPRS, etc…).

[17] NPRM, Paragraph 4.
[18] NPRM, Paragraph 7.
[19] *See* 47 C.F.R. § 22.909.

The FCC has also requested comments on whether the pico cells should be individually licensed or subject to some form of "blanket" license or individual registration.[20] Rockwell Collins suggests that the Commission develop a licensing scheme that would permit blanket licensing of the pico cells for the manufacturers but would require each pico cell to be individually registered. This system is necessary to identify pico cells that cause interference to terrestrial systems and would allow the FCC to quickly identify and the parties who violate its rules.

3. Applicability to Other Parts of FCC Regulations

The Commission also seeks comments on whether the pico cell proposal should apply to Part 24 or 27[21] as well as to Part 90 operations, or some subset of Part 90 consumer equipment.[22] Rockwell Collins recommends that the FCC adopt rules that apply to all appropriate band and transmission technologies covered by Parts 22, 24, 27, and 90. As far as propagation and other RFI-related factors are concerned, the differences are insignificant between the equipment covered by the various parts of the Commission's Rules. If all of these devices are operated under the control of a pico cell, then it would be easier to mitigate the effects of RFI to terrestrial networks. In addition, it would better facilitate RFI compatibility with onboard aircraft systems.

Since future cell phones as well as other devices will use multiple waveforms/protocols which include Bluetooth, WiFi, WiMax, and other technologies, the use of these devices on airborne aircraft should also be governed by these rules. Finally, Rockwell Collins suggests the pico cell proposal should not apply entirely to Part 90 devices but only to the Part 90 subset of equipment involving airborne wireless handsets.

B. Other Airborne Uses of 800 MHz Cellular Spectrum

---

[20] NPRM, Paragraph 19.
[21] NPRM, Paragraph 21.
[22] NPRM, Paragraph 20.

The FCC has requested comments on ways that the 800 MHz spectrum could be used as a communications pipe between airborne aircraft and the ground.[23] Rockwell Collins recommends that the 800 MHz spectrum should only be used if a standard is established for spectrum management that allocates specific spectrum to the air-to-ground interface in such a manner as to avoid interference with terrestrial systems that operate on 800 MHz. This standard should discuss the use of directional antennas, different frequency pairing, whether there would be a one-to-one relationship between cell phone channels on the aircraft and air-to-ground, or whether the air-to-ground links would be "broadband" in terms of aggregating the cell phone calls and data traffic. The standard should also stress that the utilization of the spectrum should be limited to current defined uses (i.e. cell phones, other devices that use cell phone waveforms, etc…).

The Commission also seeks comments on whether an industry standard should be developed that would allow 800 MHz cellular licensees to offer airborne cellular service.[24] The Commission noted that the Electronic Industries Alliance and/or its affiliate the Telecommunications Industry Association have led successful efforts to develop standards for new technologies.[25] As previous noted in section A, Rockwell Collins supports the adoption of an industry developed standard.[26] This standard should include the same technical rules that are developed for the operation of the pico cells. In addition, this standard should take into account RFI compatibility with key aircraft systems. Further, Rockwell Collins strongly urges this standard be clearly defined before the Commission permits the use of cell phones aboard airborne aircraft.

CONCLUSION

The FCC has proposed to replace or relax its ban on the use of 800 MHz cellular handsets aboard airborne aircraft because it would lead to greater access for mobile phone and broadband

[23] NPRM, Paragraph 22.
[24] NPRM, Paragraph 23.
[25] *Id.*
[26] *Id* at Page 3.

services during flight for passengers and the flight crews. As suggested in the foregoing comments, Rockwell Collins supports this proposal; however, the Commission must proceed with caution. It must address several issues before changing its current regulations. These issues include: clearly defining the technical standards for the design, development, and operation of the pico cell; deciding whether to allow the technical standards to be developed by industry participation or solely by the Commission; determining whether the standards developed for Part 22 should apply to other devices under Parts 24, 27, and 90; and address other issues concerning the licensing and use of the 800 MHz spectrum, such as secondary use of the spectrum by third parties and whether third parties should be able to use this spectrum under any circumstances. Rockwell Collins looks forward to working with the Commission on these important issues. Please direct any question to John Gifft at 703-516-8213.

Respectfully Submitted,

ROCKWELL COLLINS, INC.

By: 

Linda C. Sadler
Director, Federal Affairs
1300 Wilson Blvd.
Suite 200
Arlington, VA 22209
703-516-8200
lcsadler@rockwellcollins.com

Dated: May 26, 2005